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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/539,139
Filing Date: August 18, 2005
Appellant(s): HARMS ET AL.

James A. Balazs
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed July 24, 2009 appealing from the Office action mailed February 25, 2009.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

CA 2421115 A1	Grigo et al.	1-2001
JP 61274799	Masuda et al.	12-1986
3,997,447	Breton et al.	12-1976

The translation of JP 61274799 is provided in Appendix 8A.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

Claims 1, 3, 4, 7-13, and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Grigo et al. (Canadian Patent No. CA 2421115A1, Jan. 11, 2001 – the English version of EP1149619A1 that is in German), in view of Masuda et al. (JP61274799, Dec. 4, 1986 – The EPO abstract in English, the JPO abstract in English, and the patent) that discloses stationary gas installations to clean rotary filters, and further in view of Breton et al. (US Patent No. 3,997,447, Dec. 14, 1976) that teaches gas installations in the hollow shaft of a rotary filter.

Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Grigo et al. (Canadian Patent No. CA 2421115A1, Jan. 11, 2001 – the English version of EP1149619A1 that is in German), in view of Masuda et al. (JP61274799, Dec. 4, 1986 – The EPO abstract in English, the JPO abstract in English, and the patent) that discloses stationary gas installations to clean rotary filters.

Grigo et al. discloses the same machine except that the paddle, used to agitate the waste water and clean the filter elements, is replaced with a gas installation to do the same task. Masuda et al. teaches, "To efficiently treat waste water, by mounting a treatment tank and a filter means and forming the filter means by parallelly arranging a plurality of filter plates each having a hole provided to the central part thereof to a hollow rotary shaft while providing a gas emitting aeration means between the filter. . . . The microbes or solid substances adhered to and accumulated on the surface of the

semipermeable membrane 30 are washed away when the surface of the membrane passes the position of a gas emitting pipe 40 every one rotation of a filter means 16. By this method, waste water treatment and filtering treatment can be effectively preformed in the same tank." Masuda et al., EPO abstract and Figs. 1 and 2.

Grigo et al. discloses the same machine except that the paddle, used to agitate the waste water and clean the filter elements, is replaced with a gas installation to do the same task. Breton et al. discloses "fluid processing devices primarily intended for filtration but which devices may also be used for dispensing or sparging liquids and gases into a body of fluid medium." Breton et al., Abstract, lines 1-4. Breton et al. further teaches, "Also disclosed are porous elements of laminated structure in propeller or disc configurations which may be coated with microporous active surfaces to permit filtration of extremely small sized particles from a fluid medium or dispensing of extremely small sized bubbles or gas or droplets of liquid into a body of fluid medium." Breton et al., Abstract, lines 12-17. Breton et al. also discloses that because of the simple equipment used to make the extremely small sized bubbles, it is possible to sparge "very large quantities of liquid such as those processed in municipal waste treatment plants." Breton et al., col. 13, lines 30-32; Figs. 1-6.

Independent claims 1, 13, and 15 appear below in italics, with the prior art and examiner's comments in normal font. Analyses follow for the dependent claims 3-4, 7-12, and 14.

Claim 1. (Currently Amended) A filter device (1) (Grigo et al., Abstract, lines 1-3; Fig. 1, filter device 1) *for the separation of undissolved solid substances from*

liquids, in particular in the fields of waste water purification and water treatment, with several filter elements (6) (Grigo et al., Abstract, lines 4-8; Fig. 1, filter elements 4), *for the introduction into a container (2)* (Grigo et al., Abstract lines 13-18; p. 6, lines 16-17; Fig. 1, container 2 or vessel 2) *containing the unpurified liquid, wherein through the individual filter elements (6) a filtrate is capable of being drained away* (Grigo et al., p. 6, lines 21-22 and p. 6a, lines 13-15), *the filter elements are arranged so as to be capable of rotating around a horizontal axis* (Grigo et al., p. 6 lines 16-17; Fig. 1), *and the filter elements (6) are designed and arranged in such a manner, that they form a hollow space (4)* (Grigo et al., Abstract, lines 13-18; Fig. 1, hollow area 14) *in the center, and wherein the filter device (1) comprises a gassing installation (8)* (Masuda et al., Figs. 1 and 2, reference part 38 which has a gas emitting pipe 40 and a pipe 42 stationarily arranged), *which is stationarily arranged in the hollow space (4) and which for the formation of a mixture of gas and liquid is capable of being impinged with compressed gas* (Masuda et al., Figs. 1 and 2; EPO abstract, lines 19-24, that states, "The microbes or solid substances adhered to and accumulated on the surface of the semipermeable membrane 30 are washed away when the surface of the membrane passes the position of a gas emitting pipe 40 every one rotation of a filter means 16.") *and which is arranged in such a manner, that in the liquid a flow of a mixture of gas and liquid is capable of being produced at the filter elements (6), which renders an adhesion of solid substances to the filter elements (6) more difficult, and the filter elements (6) are arranged to be rotatable around the gassing installation (8)* (Masuda et al., Figs. 1 and 2 where filter means 16,

with semipermeable membranes 30, rotate past gas emitting pipes 40; EPO abstract, lines 19-24),

wherein the gassing installation (8) comprises either at least one elongated hollow body (10) (Masuda et al., Figs. 1 and 2, reference part 42 and gas emitting pipes 40) *only in the hollow space* (Grigo et al., Abstract, lines 13-18; Fig. 1, hollow area 14) *and arranged parallel to a hollow shaft (9)* (Masuda et al., Figs.1 and 2, reference part 18), *which is closed at the ends on both sides, or comprises at least one elongated hollow body (10)* (Breton et al., Fig. 6, reference part 42 that is arranged horizontally and orthogonally to hollow shaft 35) *only in the hollow space* (Grigo et al., Abstract, lines 13-18; Figure 1, hollow area 14) *and arranged horizontally as well as orthogonally to a hollow shaft (9), and the at least one hollow body (10)* (Breton et al., Fig. 6, reference part 42) *is connected with a chamber (12)* (Breton et al., Fig. 6, center of hollow shaft 35) *of the hollow shaft (9) through connecting pieces (11)* (Breton et al., Fig. 6, reference part 37), *wherein the chamber (12) is connected with a compressed gas generator (14)* (Breton et al., col. 14, lines 58-63; Figs. 1-6 and col. 14, line 68 through Column 15, line 4 where "air was forced, at a rate of 5 liters per minute, in through . . . hub 35 and out through . . . distribution layer 40 and surface layer 41" – indicating the presence of a compressed gas generator).

Grigo et al. discloses the claimed invention except that the paddle used to agitate the waste water and clean the filter elements is replaced with a gas installation to do the same task. Grigo et al., Fig. 1. Matsuda et al. teaches that it

is known in the waste water treatment art to construct a rotary filter with disk filters rotating on a horizontal shaft and to provide a "a gas emitting aeration means between the filters" such that, "The microbes or solid substances adhered to and accumulated on the surface of the semipermeable membrane 30 are washed away when the surface of the membrane passes the position of a gas emitting pipe 40 every one rotation of a filter means 16. By this method, waste water treatment and filtering treatment can be effectively performed in the same tank." Matsuda et al., Figures 1 and 2; EPO abstract, lines 6-8 and 19-27. It would have been obvious to one having ordinary skill in the art at the time the invention was made, in the Grigo et al. device, to have replaced the Grigo et al. paddle with the gas installation as taught by Matsuda et al. since Matsuda et al. states in the EPO abstract, lines 19-27, that such a modification would allow the filter elements to be washed by the "gas emitting aeration means" as the elements rotated past and, also, that "waste water treatment and filtering treatment [could] be effectively performed in the same tank."

Grigo et al. discloses the claimed invention except that the paddle used to agitate the waste water and clean the filter elements is replaced with a gas installation to do the same task. In Fig. 6 and in Example 5 (col. 14, line 58 to col. 15, line 13), Breton et al. teaches that it is known to construct a gas installation (Fig. 6 connected to the air compressor of Example 5) where the aeration gas enters the liquid medium through hollow bodies (reference part 42) that are connected (via reference part 37) to a hollow shaft (hollow shaft 35) which is supplied with gas from a gas compressor (in Example 5, the gas is air).

It would have been obvious to one having ordinary skill in the art at the time the invention was made, in the Grigo et al. device, to have replaced the Grigo et al. paddle with the gas installation as taught by Breton et al. since Breton et al. states in Example 5, col. 14, lines 58-59 and col. 15, lines 5-6, that such a modification demonstrates "superior sparging ability," i.e., "the water was completely full of tiny air bubbles." Breton et al. further states that the simple mechanical equipment employed to make the tiny bubbles can be used to sparge "very large quantities of liquids such as those processed in municipal waste treatment plants." Breton et al., col. 13, lines 30-33.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 1 limitations.

Claim 13. (Currently Amended) A filter device for the separation of undissolved solid substances from liquids, in particular in the fields of waste water purification and water treatment, with several filter elements, for the introduction into a container containing the unpurified liquid, wherein through the individual filter elements a filtrate is capable of being drained away, the filter elements are arranged so as to be capable of rotating around a horizontal axis, and the filter elements are designed and arranged in such a manner, that they form a hollow space in the center, and wherein the filter device comprises a gassing installation, which is stationarily arranged in the hollow space and which for the formation of a mixture of gas and liquid is capable of being impinged with compressed gas and which is arranged in such a manner, that in the liquid a flow of a mixture of gas

and liquid is capable of being produced at the filter elements, such that this flow renders an adhesion of solid substances to the filter elements more difficult, and in that the filter elements are arranged to be rotatable around the gassing installation

wherein the gassing installation (Masuda et al., Figs. 1 and 2, reference part 38 which has a gas emitting pipes 40 and a pipe 42; Breton et al., Figs. 1-6) *comprises at least one elongated hollow body* (Masuda et al., Figs. 1 and 2, reference part 42 and gas emitting pipes 40; Breton et al., Fig. 6, reference part 42) *that is either porous or provided with holes* (Masuda et al., Figs. 1-3, reference part 44; Breton et al., Fig. 6, reference parts 40 and 41) *and that is connected to a compressed gas generator* (Masuda et al., Abstract, lines 6-8, "providing a gas emitting aeration means between the filter plates"; Breton et al., col. 14, lines 58-63; Figs. 1-6 and col. 14, line 68 through col. 15, line 4 where "air was forced, at a rate of 5 liters per minute, in through . . . hub 35 and out through . . . distribution layer 40 and surface layer 41" – indicating the presence of a compressed gas generator), *wherein the elongated hollow body* (Masuda et al., Figs. 1 and 2, reference part 42 and gas emitting pipes 40; Breton et al., Fig. 6, reference part 42) *is located only within the hollow space* (Grigo et al., Abstract, lines 13-18; Figure 1, hollow area 14) *formed by the filter elements* (Grigo et al., Abstract, lines 4-8; Fig. 1, filter elements 4).

Claim 13 includes claim 1 limitations already discussed above plus a newly amended portion indicated by underlining. An element-by-element matching to

the prior art is also shown above. As such, the references are combined as they were in the claim 1 patentability analysis.

To recap, it would have been obvious to one having ordinary skill in the art at the time the invention was made, in the Grigo et al. device, to have replaced the Grigo et al. paddle with the gas installation as taught by Matsuda et al. since Matsuda et al. states in the EPO abstract, lines 19-27, that such a modification would allow the filter elements to be washed by the "gas emitting aeration means" as the elements rotated past and, also, that "waste water treatment and filtering treatment [could] be effectively performed in the same tank."

Furthermore, it would have been obvious to one having ordinary skill in the art at the time the invention was made, in the Grigo et al. device, to have replaced the Grigo et al. paddle with the gas installation as taught by Breton et al. since Breton et al. states in Example 5, col. 14, lines 58-59 and col. 15, lines 5-6, that such a modification demonstrates "superior sparging ability," i.e., "the water was completely full of tiny air bubbles." Breton et al. further states that the simple mechanical equipment employed to make the tiny bubbles can be used to sparge "very large quantities of liquids such as those processed in municipal waste treatment plants." Breton et al., col. 13, lines 30-33.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 13 limitations.

Claim 15. (Currently Amended) A filter device for the separation of undissolved solid substances from liquids, in particular in the fields of waste

water purification and water treatment, with several filter elements, for the introduction into a container containing the unpurified liquid, wherein through the individual filter elements a filtrate is capable of being drained away, the filter elements are arranged so as to be capable of rotating around a horizontal axis, and the filter elements are designed and arranged in such a manner, that they form a hollow space in the center, and wherein the filter device comprises a gassing installation, which is stationarily arranged in the hollow space and which for the formation of a mixture of gas and liquid is capable of being impinged with compressed gas and which is arranged in such a manner, that in the liquid a flow of a mixture of gas and liquid is capable of being produced at the filter elements, which renders an adhesion of solid substances to the filter elements more difficult, and the filter elements are arranged to be rotatable around the gassing installation,

wherein the gassing installation (Masuda et al., Figs. 1 and 2, reference part 38 which has a gas emitting pipes 40 and a pipe 42; Breton et al., Figs. 1-6) *comprises a hollow shaft* (Masuda et al., Figs. 1 and 2, gas emitting pipes 40 and pipe 42; Breton et al., Fig. 1, hollow shaft 1 and Fig. 6, hub 35) *with gas outlet openings* (Masuda et al., Figs. 1-3, reference part 44; Breton et al., Fig. 6, reference parts 40 and 41) *and is connected to a compressed gas generator* (Masuda et al., Abstract, lines 6-8, "providing a gas emitting aeration means between the filter plates"; Breton et al., col. 14, lines 58-63; Figs. 1-6 and col. 14, line 68 through col. 15, line 4 where "air was forced, at a rate of 5 liters per minute, in through . . . hub 35 and out through . . . distribution layer 40

and surface layer 41" – indicating the presence of a compressed gas generator), *the filter elements being arranged to be rotatable around the hollow shaft* (Grigo et al., Fig. 1, filter elements 4 are arranged to be rotatable around shaft 10 connected to pump vane wheel 15 in cavity 14), *wherein the gas outlet openings* (Masuda et al., Figures 1-3, reference part 44; Breton et al., Figure 6, reference parts 40 and 41) *are located only in the hollow space* (Grigo et al., Abstract, lines 13-18; Figure 1, hollow area 14) *formed by the filter plates* (Grigo et al., Abstract, lines 4-8; Figure 1, filter elements 4).

Claim 15 is claim 1 with (1) the filter elements arranged to be rotated around the hollow shaft and (2) the structure of the gas installation being recited as a hollow shaft with gas outlet openings. The relevant claim 1 patentability analysis will not be repeated here. Grigo et al. discloses the first limitation as shown in claim 15 above. Breton et al. discloses the second limitation, as discussed in the claim 1 patentability analysis. Breton et al., Figs. 1 and 6 and col. 14, line 58 through col. 15, line 4. It would have been obvious to one having ordinary skill in the art at the time the invention was made, in the Grigo et al. device, to have replaced the Grigo et al. paddle with the gas installation as taught by Breton et al. since Breton et al. states in Example 5, col. 14, lines 58-59 and col. 15, lines 5-6, that such a modification demonstrates "superior sparging ability," i.e., "the water was completely full of tiny air bubbles." Breton et al. further states that the simple mechanical equipment employed to make the tiny bubbles can be used to sparge "very large quantities of liquids such as those processed in municipal waste treatment plants." Breton et al., col. 13, lines 30-33.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 15 limitations.

Analysis of dependant claims 3, 4, 7-12, and 14.

Claim 3. (Previously Presented) The filter device according to claim 1, wherein the hollow space (4) is connected with the container (2) through apertures (5).
Claim 4. (Previously Presented) The filter device according to claim 1, wherein the hollow space (4) is closed relative to the container (2).

Grigo et al., in view of Masuda et al., in view of Breton et al., disclose or suggest all claim 1 limitations. Grigo et al. further teaches both connecting the hollow space with the container through apertures (Fig. 3 and p. 7, lines 8-13) and not connecting the hollow space with the container through apertures (Fig. 4 and Page 7, lines 15-18).

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all limitations in recited in claims 3 and 4.

Claim 7. (Previously Presented) The filter device according to claim 1, wherein the filter elements (6) are rotatably supported by bearings (21, 22) on the hollow shaft (9) connected with the gassing installation (8).

Claim 7 recites claim 15 limitations plus that the filter elements are supported by bearings. Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 15 limitations. Grigo et al. further teaches filter elements 4 that are rotatably supported by bearings 11 and 13 in Figs. 1-4.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 7 limitations.

Claim 8. (Previously Presented) The filter device according to claim 1, wherein the hollow shaft (9) comprises a second chamber (26), which is connected with a vacuum pump (33) for draining away the filtrate.

Grigo et al., in view of Masuda et al., in view of Breton et al., disclose or suggest all claim 1 limitations. Grigo et al. further discloses a second chamber in the hollow shaft connected to a vacuum pump for draining away the filtrate. Grigo et al., Figs. 1-4, connecting duct 19; p. 6a, line 35 through p. 7 line 1.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 8 limitations.

Claim 9. (Previously Presented) The filter device according to claim 8, wherein the chamber (26) for the draining away of the filtrate is provided with channels (27), which extend radially to the chamber (26) through the hollow shaft (9) and through a sliding ring (28) arranged as rotatable on the hollow shaft (9), which is connected with piping conduits (29), which are connected with the filter elements (6).

Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 1 limitations. Grigo et al. further discloses all claim 9 limitations except that the piping conduits (Fig. 1, reference part 18) come together before entering the sliding ring (Fig. 1, reference part 20) instead of

coming together at the sliding ring as recited by appellant. It would have been obvious to one having ordinary skill in the art at the time the invention was made to have located the piping conduits at the sliding ring, as opposed to before the sliding ring, since it has been held that rearranging parts of an invention involves only routine skill in the art. *In re Japikse*, 86 USPQ 70.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 9 limitations.

Claim 10. (Previously Presented) The filter device according to claim 1, wherein the at least one hollow body (10) of the gassing installation (8), for the purpose of preventing sedimentation from the filter liquid, is provided with open socket pieces (34) directed downwards.

Claim 12. (Previously Presented) The filter device according to claim 1, wherein the at least one hollow body (10) is designed as pipe-shaped and in order to allow the compressed gas to escape is comprised of a porous material or else is provided with holes (15).

Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 1 limitations. Claims 10 and 12 recite a further limitation that in the gassing installation there is at least one hollow body that is an open socket piece that provides a gas jet and the gas jet emanates from a porous material. Breton et al. discloses such open socket pieces in Fig. 6 where the gas jet emanates from outer layer 41 that is porous. It would have been obvious to one having ordinary skill in the art at the time the invention was made, in the Grigo et

al. filter device to have included open socket pieces to provide a gas jet that emanates from a porous layer, as taught by Breton et al., since Breton et al. states at col. 14, line 58-62 that such a modification, as is shown in Fig. 6, would provide "superior sparging ability."

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all limitations recited in claims 10 and 12.

Claim 11. (Previously Presented) The filter device according to claim 2, wherein in the upper zone of the apertures (5) semicircular spoilers are attached, in order to increase the effect of the flow of compressed air on the filter liquid.

Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 1 limitations. Claim 1 is further limited by the recited semicircular spoilers which close off the apertures and force more of the gas past the filter elements. In Figs. 1 and 2, the Masuda et al. filter device show the upper half of the filter elements acting as the recited semicircular spoilers to force more of the gas past the filter elements. A combination of familiar prior art elements (a spoiler) according to known methods (used to redirect gas flow over the filter elements) is likely to be obvious when it does no more than yield predictable results (the filter elements are better cleaned).

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all claim 11 limitations.

(10) Response to Argument

Appellant's arguments filed July 24, 2009 have been fully considered but they are not persuasive.

Appellant's arguments are listed below with the examiner's response following each argument.

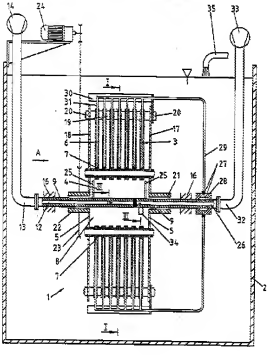
a. Regarding claims 1 and 13, appellant argues that the claims recite "[T]he elongated hollow body of the gassing installation . . . is located only within th[e] hollow space in the center of the elements." Appellant Brief, p. 12, lines 14-17; p. 14, lines 12-15; p. 18, lines 11-14. "In contrast, Grigo, does not teach or suggest the elongated body." Appellant Brief, p. 12, lines 17-18; p. 14, lines 15-16; p. 18, lines 14-15. Masuda teaches the "gas emitting pipes that must be located next to the filter plates" because "Masuda states that each time the filter assembly rotates, the filter plates pass by the gas emitting pipes" and "if the teachings of Masuda were able to be combined with those of Grigo, the gas emitting pipes in the combination would still extend next to the plates (now of Grigo) and necessarily out of the hollow space in the center of Grigo." Appellant Brief, p. 12, lines 19-24; p. 14, lines 17-22; p. 18, lines 16-21. "Breton teaches nothing regarding the spatial relationship of gas emitting pipes and plates." Appellant's Brief, p. 13, lines 2-3; p. 14, line 25 to p. 26, line 1.

The examiner responds as in the above patentability analysis. Grigo et al. discloses the same machine as applicant except that the paddle, used to agitate the waste water and clean the filter elements, is replaced with a gas

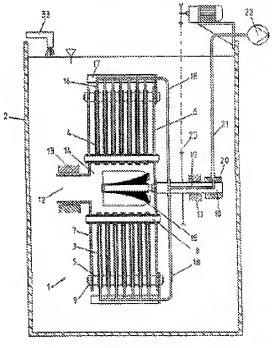
installation to do the same task. As such, Grigo et al. discloses the hollow space. Fig. 1 from the Specification and Fig. 1 from Grigo et al. are shown below for comparison.

Grigo et al. discloses the same machine as applicant except that the paddle, used to agitate the waste water and clean the elements, is replaced with a gas installation to do the same task.

Specification, Fig. 1.

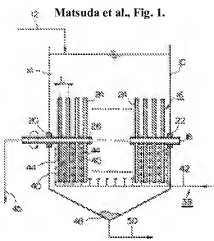


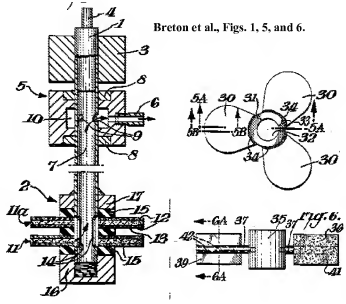
Grigo et al., Fig. 1.



Both Matsuda et al. and Breton et al. disclose such gas installations in the context of rotary filters as shown below.

Matsuda et al. and Breton et al. disclose gas installations in the context of rotary filters.





In response to applicant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, the above figures show that Grigo et al. discloses the claimed invention except that the paddle used to agitate the waste water and clean the filter elements is replaced with a gas installation to do the same task. Matsuda et al. and Breton et al. disclose such gas installations in the context of rotary filters. Matsuda et al. provides motivation to replace the Grigo et al. paddle with the disclosed gas installation

in the EPO abstract, lines 19-27, when Matsuda et al teaches that such a modification would allow the filter elements to be washed by the "gas emitting aeration means" and, also, that "waste water treatment and filtering treatment [could] be effectively performed in the same tank." Breton et al. provides motivation to replace the Grigo et al. paddle with the disclosed gas installation in Example 5, col. 14, lines 58-59 and col. 15, lines 5-6, when Breton et al. teaches that such a modification demonstrates "superior sparging ability," i.e., "the water was completely full of tiny air bubbles." Breton et al. further states that the simple mechanical equipment employed to make the tiny bubbles can be used to sparge "very large quantities of liquids such as those processed in municipal waste treatment plants." Breton et al., col. 13, lines 30-33.

In summary, Grigo et al., in view of Masuda et al., in view of Breton et al., discloses or suggests all limitations recited in claims 1 and 13.

b. Regarding claims 1 and 13, appellant continues the above Point (a) argument and argues that one of ordinary skill in the art would not have combined Grigo et al. with Masuda et al. because "the result of the proposed substitution would not have been predictable to one of ordinary skill in the art." Appellant Brief, p. 13, lines 15-17; p. 15, lines 13-15; p. 19, lines 7-9. Specifically, appellant argues, "The gas emitting pipes of Masuda physically cannot be added to the Grigo device in this manner because the extension of the pipes would interfere with the element 8 in Grigo that is part of the filter plate

structure. There is no obvious way for one of ordinary skill in the art to avoid this interference. Thus, the result of the proposed combination . . . is not predictable, instead only a malfunction or interference situation would be predictable based on the combination of cited references. Appellant Brief, p. 13, lines 19-25; p. 15, lines 17-24 p. 19, lines 11-18.

In response to applicant's argument that the gas emitting pipes of Masuda et al. cannot be physically added to the Grigo device without interfering with the filter plate structure, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981).

Furthermore, if bodily incorporation were required for patentability, which it is not, then one of ordinary skill in the art would know to make the Masuda et al. aeration device fit within the confines of the hollow space, as was done with the paddle, so that there would be no malfunction or interference situation that appellant cites as a concern.

c. Regarding claim 15, appellant makes the same arguments as were made in Points (a) and (b) above – except that it is the recited gas outlet openings on the hollow shaft (instead of the recited hollow shaft by itself recited in claims

1 and 13) that are located in the hollow space formed by the filter plates. Appellant Brief, p. 16, lines 12-22 and 25-26; p. 17, lines 12-14 and 16-23.

The examiner responds as in the above patentability analysis and Points (a) and (b). The gas outlet openings on the hollow shaft are shown in the above figures as reference part 44 in Matsuda et al. and as reference part 41 in Breton et al. Regarding the location gas outlet openings on the hollow shaft being in the hollow space, the response mirrors that of Points (a) and (b) above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Examiner, Art Unit 1797

/Walter D. Griffin/
Supervisory Patent Examiner, Art Unit 1797

Conferees:

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Appendix 8A. A translation of JP 61274799 is provided.

FTO 09-3181

CC=JP DATE=19861204 KIND=A
PN=61274799

APPARATUS FOR TREATING WASTE WATER
[Haisui no shorishochi]

Hitoshi Masuda, et al.

UNITED STATES PATENT AND TRADEMARK OFFICE
Washington, D.C. March 2009

Translated by: FLS, Inc.

Specification /615'

1. Name of this invention

Apparatus for treating waste water

2. Claim(s)

[1] An apparatus for treating waste water equipped with a waste water inflow opening, a treatment tank in which waste water is contacted with microorganisms for biologically processing the eliminative substances from the waste water, and a filtering means which is provided in this treatment tank for filtering the waste water and discharging the filtered water out of the tank; wherein said filter means is formed by arranging a plurality of filter plates parallelly at fixed intervals, each having a hole provided to the central part thereof, to a hollow rotary shaft functioning as a filtered water discharge outlet in such a manner so that said hollow rotary shaft penetrates each hole of the filter plate and is integrally rotated with the filter plates by a drive mechanism of said hollow rotary shaft, while a gas emitting aeration means is provided between each filter plate configuring said filter means.

[2] The apparatus for treating waste water according to Claim 1, wherein said filter plate is formed by allowing a semipermeable membrane to cover both sides of a membrane support body having a filtered water passage.

' Numbers in the margin indicate pagination in the foreign text.

[3] The apparatus for treating waste water according to Claim 1, wherein said gas emitting aeration means is a gas emitting pipe fixedly provided between said each filter plate and emits gas in the direction reversely slanted from the rotary direction of the filter plates.

[4] The apparatus for treating waste water according to Claim 1, wherein said gas emitting aeration means is integrated with said hollow rotary shaft and emits gas from the center part of the filter plate toward the periphery of the filter plate.

3. Detailed explanation of this invention

[Industrial Field]

This invention pertains to an apparatus for treating waste water and is particularly associated with a waste water treating apparatus which biologically treats waste water by arranging the waste water to contact with microorganisms, filters the water in the same tank, and discharges the water out of the device.

[Prior Art]

A method of biologically processing eliminative substances in waste water by allowing the waste water to contact with microorganisms is widely utilized. An activated sludge method is a typical technique which subjects organic waste water, such as sewage water, to gas emitting aeratin while microorganisms are provided in a gas emitting aeration tank to oxidize and decompose organic substances in the waste water with biochemical microorganism actions.

Microorganisms multiply rapidly in this gas emitting aeration process and are sent into a sedimentation basin in the succeeding step with the waste water processed under gas emitting aeration. A part of /660 the microrganisms deposited in a sedimentation tank is returned to said gas emitting aeration tank with returned sludge and recycled as microorganisms for the gas emitting aeration process. The remaining microorganisms are processed separately as excess sludge.

There are two significant technological problems in the aforementioned activated sludge method. The first problem is that, since the gas emitting aeration process and the sedimentation process must be performed separately, not only is a complex operation required but a large amount of land is needed for a sedimentation pond. The sedimentation process, which is usually gravity-force sedimentation by subjecting water to still-standing for several hours, causes a bulking phenomenon or the like depending on the state of the raw waste water and the operational condition to prevent sufficient sedimentation. This causes the sludge to be mixed in the discharging supernatant water to worsen the condition of the water. Moreover, since sludge is often exposed to an anaerobic condition during the sedimentation process, a part of the sludge is destroyed. As a result, the gas emitting aeration process has decreased microorganism activities or a foaming phenomenon. Furthermore, since it is difficult to maintain and control the sludge concentration (MLSS) in the gas emitting aeration tank, the capacity of the gas

emitting aeration process easily fluctuates. The second problem is that a high MLSS cannot be maintained in the gas emitting aeration tank. That is, the MLSS in the gas emitting aeration tank is equal to the MLSS of waste water flowing into the sedimentation pond. In this case, since sludge is microscopic and has a specific gravity similar to that of water, the sedimentation process becomes practically impossible when the value of the MLSS exceeds a prescribed value. Therefore, the maximum MLSS in the gas emitting aeration tank is said to be 3,000 ~ 6,000 ppm for operating the activated sludge method within an economical range. If the MLSS has this type of limitation, the load of organic substance processed during the gas emitting aeration process is naturally limited.

To solve those problems of the activated sludge method, attempts were made to increase the processing efficiency by eliminating a sedimentation pond and maintaining the MLSS in a processing tank.

For example, JP-B (Tokko) 389-11360 disclosed a method of eliminating the sedimentation process in the subsequent stage by providing a filter to the waste water discharge outlet of the gas eliminating aeration tank. However, with this method, sludge is deposited and accumulated on the filter surface to easily cause clogging. Therefore, filtering capacity worsens with the passage of time. Moreover, since the sludge adhered and accumulated on the filter surface does not contribute sufficiently to high MLSS maintenance in the processing tank, an improvement over the

integrally by a drive mechanism of the hollow rotary shaft. The filtered water from each filter plate is collected in the hollow section of said hollow rotary shaft and discharged out of the device. Moreover, a gas emitting aeration means is provided between each filter plate configuring said filter means.

Microorganisms concerning this invention are not limited to aerobic microorganisms, as anaerobic microorganisms may be used as well; for an aerobic process, gas containing oxygen, such as air, is used as the gas emitted by the aforementioned gas emitting aeration means in the case of an aerobic process. On the other hand, for an anaerobic process, gas not containing oxygen, such as nitrogen gas, is used. A preferable filter plate is, for example, a membrane support body having a filtered water passage and covered with a semipermeable membrane on both sides. The gas emitting aeration means is integrally rotated with the aforementioned filter means /661/ or fixed to a prescribed position in a processing tank separately from the filter means.

[Operation]

The filter means can be configured into many thin filter plates arranged parallelly in small intervals around a hollow rotary shaft. This configuration can provide a greater filter area per unit volume in a processing tank. Moreover, as the filter can be placed in any desired position in a processing tank due to the simple structure thereof, the filter can be arranged to utilize 100% of the processing

tank volume. As a result, a drastic reduction of filtering resistance becomes possible to enable the filter to demonstrate a sufficient filtering function even under a small pressure difference of about hydrostatic pressure based on the water level of the processing tank. The filter water is quickly discharged out from the device through the hollow part of a hollow rotary shaft. Gas emission is provided between each filter plate, and this emitted gas cleans the filter surface to constantly provide a clean filter surface, thereby allowing the filter function to be stably maintained for a long time. Moreover, the emitted gas is also used as a gas source needed for biological treatment provided by microorganisms.

[Embodiment]

Fig. 1 - Fig. 5 are explanatory diagrams illustrating the first embodiment of this invention. A waste water flow-in pipe 12 is provided in the upper part of processing tank 10 which is filled with organic waste water 14. The reference numeral 16 denotes a filter means comprising a hollow rotary shaft 18 supported by bearings 20, 22 on the side plate of processing tank 10 and rotated at a fixed speed by a drive mechanism (not shown). A plurality of filter plates 24 arranged parallelly at fixed intervals are provided to a hollow rotary shaft 18.

Fig. 2 illustrates the detailed structure of filter plate 24. The disc like filter plate 24 is configured of a hollow membrane support body 28 and a semipermeable membrane 30 covering both sides

of this membrane support body 28 and has a hole 32 at the center part. The aforementioned hollow rotary shaft 18 is provided to penetrate this hole 32, where the hollow part 33 of the membrane support body 28 and the hollow part 26 of the hollow rotary shaft 18 mutually communicate with each other. The circumference area of filter plate 24 is sealed by a sealing member 34, while the part connecting the filter plate 24 and the hollow rotary shaft 18 is sealed by a sealing member 36.

The reference numeral 38 denotes a gas emitting means having gas emitting pipes 40 each positioned in a space between parallelly arranged said filter plates 24 and connected to a gas guiding pipe 42. The gas emitting pipe 40 is a thin pipe having many gas emitting outlets 44, and as shown in Fig. 3, the emission direction (arrow A) is arranged opposite from the rotation direction (arrow B) of filter plate 24, allowing the emission flow to hit the surface of semipermeable membrane 30 of the filter plate 24, that is, the emission is directed reversely and stantedly to the rotation direction of filter plate 24.

In the aforementioned configuration, waste water 14 filled in the processing tank 10 is contacted with microorganisms suspended in said waste water for a predetermined time for receiving the biological treatment. The waste water after treatment is filtered by the semipermeable membrane 30 of said filter plate 24 and the clean filtrate passes through the membrane support 28, the hollow part 33

of the membrane support 28 and the hollow part 26 of the hollow rotary shaft in this order to be discharged out of the apparatus as treated water 45. The microbes or solid substances are temporarily adhered to and accumulated on the surface of the semipermeable membrane 30 with filtering. However, this sludge is washed away from the membrane surface by the gas emitted from said gas emitting pipe 40 and the stirring action of the waste water caused by gas emission. That is, since the surface of each membrane passes the position of said gas emitting pipe 40 every one rotation of filter means 16, the membrane surface is cleaned in extremely short cycles. Therefore, the membrane surface can be constantly maintained clean to stably and continuously provide the filter function for a long period. The sludge washed away from the membrane surface is suspended again in the waste water, allowing the MLSS in the processing tank 10 to be kept at a high level of about 5,000 - 10,000 ppm for example. Therefore, compared with the conventional activated sludge method, the processing capacity becomes several times higher. Hence, the volume of processing tank 10 can be reduced accordingly. Moreover, operation at the MLSS of 8,000 - 5,000 is also possible in the same way as the conventional activated sludge method. The emitted gas utilized for cleaning the membrane surface of said filter device 18 can be used as an air source during biologically aerobic processing of the device, and also as a gas source for maintaining the anaerobic

state for anaerobic processing. As shown in Fig. 4, mutual contacts among waste water, sludge and gas are effectively carried out by agitation and rising air bubbles provided by the emitted gas and the rotation of filter plates 24. While the abovementioned process is carried out continuously, as the MLSS in the processing tank 10 gradually increases due to multiplication of microorganisms, the nutrients source (i.e., organic substances to be processed) in the raw waste water may become insufficient, which could result in bilateral decreased sludge activity. Therefore, a sludge depositing part 48 is provided in the lower section of processing tank 10 so as to continuously or intermittently pull out excess sludge through a sludge discharge pipe 50. /66f

The filter driving force of the filter means is the difference between the waste water pressure and the filter water pressure, where the hydrostatic pressure is conveniently used as a means of acquiring this pressure difference. The filter means is preferably disposed in the lowest possible section of the processing tank 10 for maximally utilizing the hydrostatic pressure. In addition to the hydrostatic pressure, the pressure difference may be increased by increasing the pressure at the waste water side or decreasing the pressure at the filter side.

The membrane support body used as a filter plate may be a porous body of sintered metal, ceramic, porous plastic, etc., a porous plate provided with an irregular surface for forming filtrated water

passages, etc. The aforementioned hollow part 38 is not particularly necessary to this membrane support body as long as a passage for filtrated water is provided; for example, a filter plate may be formed by utilizing an integrally formed porous plate as a membrane support body and covering both sides thereof with a semipermeable membrane. Moreover, the filter face of the filter plate is not limited to a semipermeable membrane and other types of membrane having fine holes, such as a coated film, may be used. The microorganisms suspended in the processing tank 10 are selected based on the substances to be removed from the waste water. As a method of suspending microorganisms, instead of simple suspension without the use of any specific method, microorganisms may be carried by a fine inorganic carrier, or immobilized microorganisms prepared by inclusively immobilizing microorganisms in high molecular gel may be fluidized as in the case of the conventional activated sludge method. Particularly with the use of immobilized microorganisms, not only the MLSS can be maintained stably at a high level but an amount of sludge suspended individually in waste water can be reduced to 1/100 - 1/1,000 compared with the activated sludge method. Hence, this method is highly effective since the suspended solid load in the filtering process is drastically reduced.

Fig. 5 illustrates an example of a gas emitting pipe shaped differently. Fig. 5 (a) illustrates a gas emitting pipe 40A having a baffle plate 82 at the rear side thereof, and Fig 5 (b) illustrates a

gas emitting pipe 40 having a triangular cross-section. Both cases provide accelerated agitation and impact effects to the liquid and gas near the membrane surface for cleaning the membrane surface more effectively.

Fig. 6 illustrates the second embodiment of this invention. In this embodiment, two pairs of filter means 56 each having a hollow rotary shaft 54 are so arranged that the filter plate 58 of one filter means is inserted between filter plates of the other filter means, thereby allowing the filter plate of each filter means to be alternately positioned. By arranging the rotary direction of each filter means to be mutually opposite, the agitation speed of the liquid near the filter surface can be accelerated to suppress the concentration polarization on the filter surface. Furthermore, the hollow rotary shaft 54 is double-layered so that an outer pipe 60 of double pipes can function as a filtrated water passage while an inner pipe 62 can function as a gas passage for gas emitting aeration. The inner pipe 62 communicates with a gas emitting hole 64 having an opening between parallelly arranged filter plates 58 and emits gas from a gas guiding pipe 66 to the waste water side. Note that the reference numeral 66 denotes a drive system for the hollow rotary shaft and reference numerals 68 and 70 respectively denote rotary joints connecting the pipe passage and the hollow rotary shaft.

According to this embodiment, the filter area of the filter means is increased while the filter surface is more effectively cleaned by the mutual rotations of each filter means.

Moreover, since a passage for gas emitting aeration is integrally provided to the hollow rotary shaft, the device structure is simplified to allow easy maintenance of the filter means and the gas emitting aeration means.

Although a disc-like filter plate was explained for configuring the filter means in the aforementioned embodiments, the filter plate is not limited to disc-like shapes and may be rectangular or polygonal instead. Moreover, although the explanation described above was based on a horizontally formed hollow rotary shaft of a filter means and filter plates mounted perpendicular to this hollow rotary shaft, this configuration may be reversed by arranging the hollow rotary shaft perpendicularly and horizontally positioning the filter plates. In addition, the filter plate does not need to be perpendicular to the hollow rotary shaft and may be mounted slantingly. When the filter plate is mounted slantingly, stronger liquid agitation is provided by the rotating filter plates to improve the effect of filter surface cleaning. Furthermore, the outside /663
face of the filter plate may be umbrella-like or partly spherical as it is not limited to a simple planar state.

[Effect of the Invention]

According to this invention, biological waste water treatment with microorganisms and filtering treatment of processed waste water can be effectively performed in the same tank. As a result, biological treatment of waste water can be stably and efficiently carried out for a long period with the MLSS maintained at a high level in the processing tank. Moreover, since the hydrostatic pressure or hydrostatic pressure with a small forced additional pressure or reduced pressure is sufficient as a filter drive force for filter treatment, energy needed for filtering can be small.

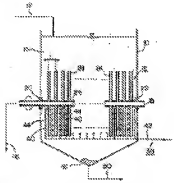
4. Simple explanation of the figures

Fig. 1 - Fig. 5 are diagrams explaining the first embodiment of this invention, where Fig. 1 illustrates a sectional side view of the overall device; Fig. 2 illustrates a sectional partial view of a detailed configuration of the filter device; Fig. 3 is an explanatory diagram illustrating the sectional view of the gas emitting pipe; Fig. 4 illustrates a sectional front view; and Fig. 5 is an explanatory diagram illustrating an example of a different sectional shape of the gas emitting pipe. Fig. 6 is a sectional side view illustrating the overall device of the second embodiment of this invention.

10...Processing tank; 12...Waste water flow-in pipe; 16...Filter means; 18...Hollow rotary shaft; 24...Filter plate; 28...Membrane

support body; 30...Semipermeable membrane; 31...Hole; 33...Gas emitting aeration means; 40...Gas emitting pipe

Figure 1



Key: 10...Processing tank; 16...Filter means; 18...Hollow rotary shaft; 24...Filter plate; 36...Gas emitting aeration means; 40...Gas emitting pipe.

Figure 2

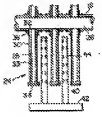


Figure 3

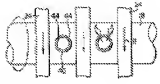


Figure 4

/664

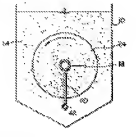


Figure 5

(a) (b)

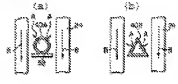


Figure 6